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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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*Ex parte* DANIEL W. CUSHING, EUGENE A. JACKSON,
KEITH H. NOVAK, DAVID N. DUNN and GREGORY R. BELL

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Appeal 2009-002873
Application 10/707,612
U.S. Patent Publication 2005-0142968
Technology Center 1700

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Decided: August 18, 2009

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*Before*: FRED E. McKELVEY, *Senior Administrative Patent Judge*, and SALLY GARDNER LANE and SALLY C. MEDLEY, *Administrative Patent Judges*.

McKELVEY, *Senior Administrative Patent Judge*.

DECISION ON APPEAL

A. Statement of the case

The Boeing Company ("Boeing"), the real party in interest, seeks review under 35 U.S.C. § 134(a) of a final rejection (mailed 09 March 2007).

Claims 1-2 and 4-5 are in the application.

The application was filed on 24 December 2003.

The Examiner relies on the following evidence:

| | | |
|---|---|---|
| Tsotsis | U.S. Patent Publication 2004/0219855 | 04 Nov. 2004 |
| Gomez | U.S. Patent 5,319,003 | 07 Jun. 1994 |
| Celanese I | Complete Textile Glossary, Celanese Acetate—definition of "nonwoven fabric" | 2001 |
| Celanese II | Complete Textile Glossary, Celanese Acetate—definition of "fabric" | 2001 |

The reader should know that "et al" is not used in this opinion.

All evidence relied upon by the Examiner is prior art under 35 U.S.C. § 102(b).

We have jurisdiction under 35 U.S.C. § 134(a).

B. Findings of fact

The following findings of fact are supported by a preponderance of the evidence.

References to the specification are to U.S. Patent Publication 2005/0142968 A1.

To the extent that a finding of fact is a conclusion of law, it may be treated as such.

Additional findings as necessary may appear in the Discussion portion of the opinion.

The invention

Boeing's invention generally relates to composite materials and more specifically to translucent, flame resistant composite materials that are said to be useful in aircraft interiors and other aerospace applications. Specification, ¶ 0001.

According to Boeing, prior art plastic materials used in commercial aircraft do not typically achieve the combination of a desired transmissivity of light while meeting FAA [Federal Aviation Administration] requirements in terms of flammability resistance properties, vertical burn, smoke emissions tests, and toxic fume emissions tests. Interior components have typically been made of non-translucent (opaque), or marginally translucent plastic materials that meet these FAA requirements. Specification, ¶ 0004.

Boeing's invention is said to involve composite materials that meet or exceed the FAA requirements in terms of flammability resistance properties, including heat release, vertical burn, smoke emissions tests, and toxic fume emissions tests. The composite materials are said to be capable of post-processing to form various translucent components used throughout the interior of a cabin on an aircraft that allow transmissivity of desirable amounts of light. Specification, ¶ 0006.

The composite material consists of long glass fibers encapsulated within a polyphenylsulfone (PPSU) substrate material. The long glass fibers are preferably configured within a loose weave or may alternatively be unidirectional in nature so long as the fibers meet the requirements for light transmission and flammability. Specification, ¶ 0007.

The composite material is formed as a two-layer or three-layer system. In the two-layer system, the glass fibers are laminated to one side of the PPSU substrate. In a three-layer system, the glass fibers are sandwiched between and laminated to two layers of the PPSU substrate. Specification, ¶ 0008.

Fig. 15, reproduced below, is a side view of a two-layer composite material having weaved fibrous material used to form translucent components. Specification, ¶ 0011.

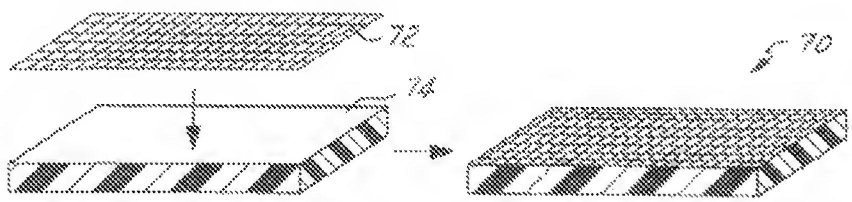


FIG. 15

Fig. 15 depicts a two-layer composite.

Fig. 16, reproduced below, is a side view of a three-layer composite material used to form translucent components. Specification, ¶ 0012.

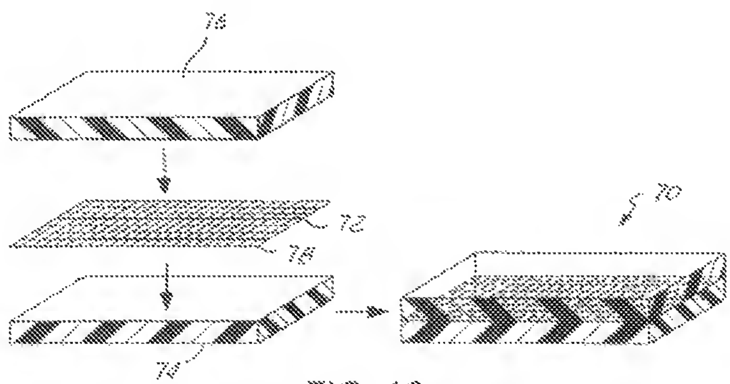


FIG. 16

Fig. 16 depicts a three-layer composite.

In Fig. 15, a two-layer composite material 70 is formed by laminating a layer of weaved fibrous material 72 to a substrate material 74. Specification, ¶ 0021.

In Fig. 16, a three-layer composite material 70 is formed by introducing second layer of substrate material 76 having the same composition as first layer 74 such that the fibrous material 72 is sandwiched and laminated between first and second layer 74, 76. Specification, ¶ 0021.

In Fig. 17 [not reproduced], an alternative embodiment describes a unidirectional, nonweaved fibrous material 72 laminated to the substrate material to form another two-layer translucent composite material 70. Specification, ¶ 0021.

The substrate material 74 is chosen based on the application for which it is utilized. In the case of airplane interior components, the substrate material 74 is chosen to allow adequate light transmissivity for the desired component. The substrate material 74 has the ability to soften to permit lamination of the fibrous material 72 as well as being able to be post processed to form a translucent component having a desired shape and thickness. Specification, ¶0023.

One thermoplastic resin that meets these requirements is polyphenylsulfone, otherwise known as PPSU. PPSU is a translucent thermoplastic material that is relatively light transmissive and typically has a light brown tint. As one of ordinary skill appreciates, many grades of PPSU are commercially available, each having slightly varying transmissivity and flammability resistant properties. Specification, ¶ 0024.

The fibrous material 72 is added to PPSU substrate 74, 76 to provide retention of the composite panel 60 [Fig. 14—not reproduced] in the event of fire. The fibrous material 72 laminated within the substrate or substrates 74, 76 is said to allow compliance with the FAA certification requirement for flammability resistance properties, including heat release, vertical burn, smoke emissions tests, and toxic fume emissions tests. Long glass fibers 78 [Fig. 15] are preferred for use as the fibrous material 72 due to their ability to (1) act as thermal insulators, (2) allow substrate 70 to pass flammability tests, (3) not overly decrease light transmissivity, as well as (4) their overall appearance within the PPSU substrate 74, 76. Specification, ¶ 0025.

Two suitable glass fibers 78 are said to be e-type and s-type glass fibers. Specification, ¶ 0027.

<u>Claims on appeal</u>

Claims 1-2 and 4-5 are on appeal.

Claim 1 is an independent claim.

Claims 2 and 4-5 are dependent claims.

Boeing does not argue the separate patentability of claims 2 and 4-5.

Accordingly, we decide the appeal on the basis of claim 1.

Claim 1, which we reproduce from the Claim Appendix of the Appeal Brief, reads [bracketed matter and some indentation added]:

<u>Claim 1</u>

A two-layer composite material for use in translucent, flame-resistant components comprising:

[1] a substantially continuous nonwoven thermoplastic polyphenylsulfone substrate; and

[2] a plurality of long glass fibers having a melting temperature above the melting temperature of said polyphenylsulfone and laminated within said polyphenylsulfone substrate,

wherein said plurality of long glass fibers is selected from the group consisting of

[a] a plurality of long s-type glass fibers and

[b] a plurality of long e-type glass fibers,

wherein said composite material

[i] has an average allowable heat release not exceeding a 65/65 standard and

[ii] can be post processed by bending, cutting or thermoforming.

## Prior art

### 1. *Tsotsis*

The Tsotsis invention relates to cured composites built from layers of unidirectional fibers. ¶ 0001.

The Examiner found that Tsotsis describes a two-layer composite material formed from a substantially continuous nonwoven polyphenylsulfone substrate material and a plurality of unidirectional long glass fibers substantially embedded with the substrate material. Examiner's Answer, page 3.

According to Tsotsis, a multiaxial fabric is prepared that is made of alternating layers of reinforcing unidirectional fibers and non-woven interlayers. The non-woven interlayers comprise a spunbonded,

spunlaced, or mesh fabric of thermoplastic fibers. The interlayers are disposed between and knit-stitched to the reinforcing layers. ¶ 0020.

Layers of unidirectional fibers for use in the multiaxial preforms and fiber reinforced composite materials of the invention are well known in the art. In a preferred embodiment, the unidirectional fibers are made of carbon fibers. Other examples of unidirectional fibers include, without limitation, *glass* fibers and mineral fibers. Such layers of unidirectional fibers are usually prepared by a laminating process in which unidirectional carbon fibers are taken from a creel containing multiple spools of fiber that are spread to the desired width and then melt-bonded to a thermoplastic interlayer, as described above, under heat and pressure. ¶ 0022.

The interlayer is made of a spunbonded, spunlaced, or mesh fabric of thermoplastic fibers. The thermoplastic fibers may be selected from among any type of fiber that is compatible with the thermosetting resin used to form the fiber reinforced composite material. For example, the thermoplastic fibers of the interlayer may be selected from the group consisting of polyamide, polyimide, polyamideimide, polyester, polybutadiene, poly-urethane, polypropylene, polyetherimide, polysulfone, polyethersulfone, *polyphenylsulfone*, polyphenylene sulfide, polyetherketone, polyethertherketone, polyarylamide, polyketone, polyphthalamide, polyphenylenether, polybutylene terephthalate and polyethylene terephthalate. ¶ 0023.

The multiaxial preform comprises a plurality of reinforcing layers with interlayers disposed between the reinforcing layers and melt-bonded to at least one of the reinforcing layers. It is preferred to use multiaxial

preforms having 4 or more reinforcing layers of unidirectional fabrics. In another embodiment, the preform has from 2-16 layers of unidirectional *fabrics*. ¶ 0032.

Fig. 2, reproduced below, shows a multiaxial preform for a composite material for use in a liquid-molding process of the invention. ¶ 0037.

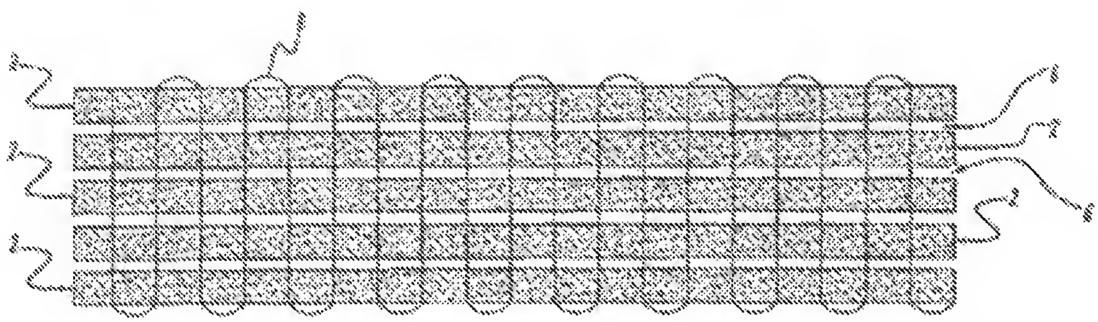

FIG - 2

Fig. 2 depicts a multiaxial preform.

In Fig. 2, interlayers 6 made of thermoplastic fibers are disposed between reinforcing fabric layers 2 of unidirectional fabrics. In a preferred embodiment, at least some of the interlayers are melt-bonded to an adjacent reinforcing fabric layer. A sewing thread 8 may be used to hold the preform layers together.

In one Tsotsis embodiment, an interlayer material may be melt-bonded to one or both sides of a unidirectional dry fabric to produce a dry unidirectional tape. ¶ 0040. Fig. 3 [not reproduced] illustrates such a process. The product produced by the Fig. 3 process is shown in Fig. 3a, reproduced below.

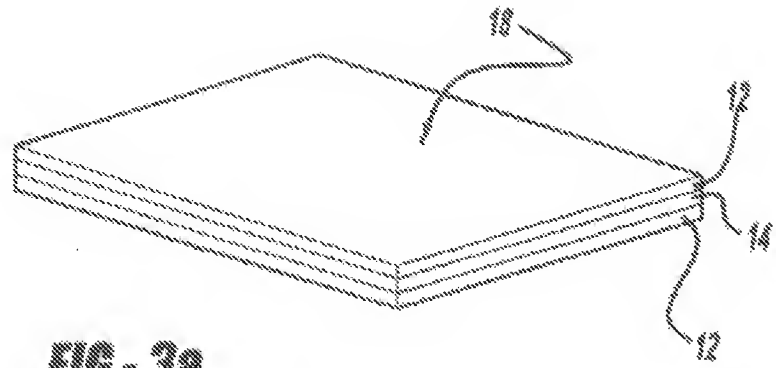


FIG - 3a

Fig. 3a depicts a three-layer composite.

FIG. 3a shows a detail of the construction of a fabric 18 with interlayer material 12 melt bonded to *both* sides of the unidirectional dry fabric 14. ¶ 0040.

In an alternative embodiment, the veil material 12 may be melt-bonded to only *one* side of the unidirectional fibers 14. ¶ 0040.

2. *Gomez*

The Examiner relies upon Gomez to show that e-type and s-type glass fibers are known. Gomez, col. 3:28-32.

<u>Examiner's rejection</u>

The Examiner rejected claims 1-2 and 4-5 as being unpatentable under 35 U.S.C. § 103 over Tsotsis and Gomez.

C. Discussion

(1)

A first argument on appeal seems to rely on the fact that Boeing's claimed composite is two-layer. Reply Brief, page 1.

While Tsotsis Fig. 3a describes a three-layer product, Tsotsis also explicitly describes a two-layer product. ¶ 0040.

Boeing's two-layer requirement is therefore described in the prior art.

(2)

A second argument on appeal maintains, with reference to Tsotsis Fig. 2, that Tsotsis involves the use of fabrics. Boeing maintains, however, that the claimed composite involves "nonwoven, *non-fabric* composites" (italics added). Appeal Brief, page 9.

After consulting dictionary definitions of "nonwoven fabric" [Celanese Acetate I] and "fabric" [Celanese Acetate LLC II], the Examiner concluded that claim 1 does "not exclude a fabric substrate." Examiner's Answer, page 7. The Examiner goes on to find and conclude (*id.*):

> Rather, the current claims simply exclude a woven fabric substrate. Since a non-woven fabric is not a woven fabric, Tsotsis teaches the claimed substrate.

In our view, the Examiner got it right. Boeing's argument overlooks the breadth of claim 1.

Claim 1 calls for a "nonwoven . . . substrate" not a "nonwoven, *non-fabric* . . . substrate." The "nonwoven" material may be a nonwoven fabric, which Boeing seems to agree is (Appeal Brief, page 10):

> [a]n assembly of textile fibers held together by mechanical interlocking in a random web or mat . . . .

Tsotsis describes the use of spunbonded, spunlaced, or mesh fabric, none of which are reasonably characterized as woven fabric. Each is a "nonwoven . . . substrate" within the meaning of claim 1.

Boeing's argument overlooks the fact that "non-fabric" does not appear in claim 1.

(3)

The Examiner found that Tsotsis does not describe the use of e-type or s-type glass fibers. *See e.g.*, Examiner's Answer, page 4.

Tsotsis describes the use of glass fibers. As of the date of the Tsotsis invention (Tsotsis filed on 2 May 2003), Gomez (issued 7 June 1994) tells us, and those skilled in the art, that e-type and s-type glass fibers were known. The fact that Gomez describes the use of e-type and s-type glass fibers in a context arguably different from that of Tsotsis or Boeing does not take away from the fact that e-type and s-type glass fibers were known prior to both Tsotsis and the making of the invention on appeal. The Examiner probably could have cited any number of references to show that e-type and s-type glass fibers were known.

It is not apparent why one skilled in the art would not, and should not be able to, freely use e-type or s-type or other known glass fibers when practicing the Tsotsis invention.

An invention achieving some unpredicatable result may be patentable under § 103. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007); *United States v. Adams*, 383 U.S. 39 (1966). What is unexpected about the use of e-type or s-type glass fibers? Boeing claims to have unexpectedly come up with a composite which will pass, if not exceed, FAA requirements for airplane component parts. Specification, ¶¶ 0004 and 0006. However, Boeing nowhere in the Appeal Brief or Reply Brief calls our attention to any evidence of record which would support a finding of unexpected results—or

that any result achieved with the claimed invention is not achieved with other composite materials currently used in aircraft. Consistent with *KSR*, *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972), counsels that an inventor must show that the results the inventor says the inventor gets with the invention are actually obtained with the invention and it is not enough to show results are obtained which differ from those obtained in the prior art—any difference must be shown to be an unexpected difference.

(4)

Boeing discusses crimped fibers and suggests that crimped fibers have utility in fields removed from Boeing's field. Appeal Brief, page 10. The Examiner had a complete answer to the argument (if it is in fact an argument). To the extent that the preamble of claim 1 is a limitation (a highly doubtful proposition), the composites upon which Tsotsis claims to have improved are useful in the aerospace industry. Tsotsis, ¶ 0002. *See also* Examiner's Answer, page 6.

(5)

We have considered Boeing's remaining arguments and find none that warrant reversal of the Examiner's rejection. *Cf. Hartman v. Nicholson*, 483 F.3d 1311, 1315 (Fed. Cir. 2007).

D. Decision

Boeing has not sustained its burden on appeal of showing that the Examiner erred in rejecting the claims on appeal as being unpatentable under § 103 over the prior art.

On the record before us, Boeing is not entitled to a patent containing claims 1-2 and 4-5.

Upon consideration of the appeal, and for the reasons given herein, it is

ORDERED that the decision of the Examiner rejecting claims 1-2 and 4-5 over the prior art is *affirmed*.

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2008).

AFFIRMED

KMF

cc (via First Class mail)

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